

RECREATIONAL VEHICLE ROOF SUPPORT RAFTER
BACKGROUND OF THE INVENTION

[001] 1. Technical Field:

[002] The invention relates generally to trailers, recreational vehicles, and custom van body structures and, in particular, to a roof support of light weight and possessing ease of fabrication which supports vehicle roofs of contoured shapes of variable radii.

[003] 2. Description of the Problem:

[004] Recreational vehicles and vacation trailers make frequent use of a raised roof, which allows the addition of ceiling mounted entertainment equipment and storage space, and the routing of air ducts. Fabrication of an aesthetically pleasing roof fit for these purposes, which also exhibits strength, is better served by providing designers the ability to incorporate curved sheet metal elements, rubber membranes, or fiber glass sections, rather than flat elements. Underside supports for such roofs should conform to the shape of the roof if possible. These supports should also limit or reduce the direct labor cost involved in construction of the vehicle.

[005] Contemporary design has relied on square cross section extruded aluminum channels as structural elements. The channels are often joined using galvanized steel sheet metal gussets to fabricate roof support elements. Fabrication of roof support elements from these elements has required welding, adhesive joining or screws, adding greatly to direct labor required to construct the vehicles.

SUMMARY OF THE INVENTION

[006] According to the invention there is provided a rafter for supporting the roof of vehicle. The rafter comprises lower and upper rails of sufficient length to extend from side to side of a roof of a vehicle. The lower and the upper rail each have a cross member and an upright member extending outwardly perpendicular from one face of the cross member. The upper and lower rails are disposed in a common plane with their respective upright members extending toward one another. A plurality of gussets are attached to the upright members and extend between the lower and upper rails to join the upper and lower rails to one another. The upper rail is shaped to allow a face of the cross member to fit against an underside surface of the roof of a vehicle. The rafter further includes the lower rail having an

elongated pocket defined between one side of the upright member and a side of the cross member to one side of the upright member.

[007] Additional effects, features and advantages will be apparent in the written description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[008] The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

[009] **Figs. 1A and 1B** are perspective views of recreational vehicles.

[0010] **Fig. 2** is a front elevation of a roof support element or rafter and supported vehicle roof.

[0011] **Fig. 3A** is an enlarged front elevation of the rafter of **Fig. 2**.

[0012] **Fig. 3B** is a front elevation of an alternative embodiment for the rafter of the invention.

[0013] **Fig. 4** is a perspective view of a section of an elongated member adaptable to serve as a chord or base member of the rafter.

[0014] **Figs. 5A-B** are views of a gusset used with the chord and elongated base members.

[0015] **Fig. 6** is a detail view of one end of the rafter.

[0016] **Fig. 7** is an end of view of the rafter.

[0017] **Fig. 8** is a perspective view of a section of an alternative elongated member adaptable to serve as a chord or base member of the rafter.

[0018] **Figs. 9A-B** are views of a gusset used with the alternative elongated base members.

[0019] Fig. 10 is an end view of the alternative elongated base member.

DETAILED DESCRIPTION OF THE INVENTION

[0020] Referring now to the figures and in particular to **Figs. 1A-B** there are illustrated recreational vehicles **10, 11** having roofs **12, 13**. Roofs **12, 13** may be advantageously supported by the rafters disclosed by the present patent.

[0021] Referring to **Fig. 2**, the disposition of a roof support member or rafter **14** in relation to the underside **16** of vehicle replacement roof **12** or roof **13** is shown. Roof **12**, and its underside **16**, follow a gentle curve and are higher down the longitudinal center line of the roof than along the right and left hand sides of the vehicle. Rafter **14** supports roof **12** from side to side of the roof, the rafter conforming along the length of its upper surface to the side to side curvature of roof **12**. Rafter **14** comprises an curved upper rail or chord **30** and an elongated base member **32**, both of which are extruded aluminum members or rails. The radius of curvature of chord **30** may be varied to conform to the desired shape of replacement roof **12**. Chord **30** and elongated base member **32** are disposed with the chord positioned above and aligned with the elongated base member in a common plane. Chord **30** and elongated base member **32** are joined to one another using a plurality of gussets including gussets **22A** and **23A**. Gussets **22A** and **23A** are disposed with respect to one another and include right angle notches **24** along one edge of each of the gussets to define a frame **20** through which ventilation ducts **18** may be passed.

[0022] Referring now to **Fig. 3A**, the construction of rafter **14** is illustrated in greater detail. Chord **30** and elongated base member **32** are elongated rails disposed roughly parallel to one another discounting the curvature of chord **30**. The curvilinear shape of chord **30** brings the ends of the chord closer to the ends of base member **32** than is the center of the chord relative to the center of the elongated base member and gives upper face **72** of rafter **14** a convex shape. Base member **32** and chord **30** incorporate flange like central upright members **64** (see **Fig. 4**) which extend toward one another and stiffen the rails longitudinally. The plurality of gussets are attached at bottom and top to central upright members **64**. The gussets are identified by position in the preferred rafter **14** illustrated. At each end of rafter **14** is a rectangular end gusset **38**. Moving inwardly from the ends are rhomboid shaped gussets **36A** and **36B** which are disposed to cant inwardly from bottom to top. Still further inwardly are a second set of rhomboid gussets **34A** and **34B**, which are canted outwardly from bottom

to top. Still further inward toward the longitudinal center line of the vehicle are rhomboid gussets **22A** and **22B**. Rhomboid gussets **22A** and **22B** and **28A** and **28B** are all canted toward the center line of the vehicle from bottom to top. Rhomboid gussets **22A** and **22B** include a right angle notch on an inboard edge. Rhomboid gussets **23A** and **23B**, which are the next gussets inward from gussets **22A** and **22B**, are outwardly canted from bottom to top and also incorporate right angle notches **24**, this time along an outwardly oriented edge so that the notches define two frames **20** through a rafter **14**. Disposed along the vehicle center line and at the center of rafter **14** is a rectangular gusset **26**.

[0023] Referring now to **Fig. 3B** the construction of an alternative embodiment rafter **114** is illustrated. Again the chord **30** and elongated base member **32** are elongated rails disposed roughly parallel to one another discounting the curvature of chord **30**. The curvilinear shape of chord **30** brings the ends of the chord closer to the ends of base member **32** than is the center of the chord relative to the center of the elongated base member and gives upper face **72** of rafter **114** a convex or outwardly bowed shape. Base member **32** and chord **30** incorporate flange like central upright members **64** (similar to those illustrated in **Fig. 4**) which extend toward one another and stiffen the rails longitudinally. Instead of gussets, aluminum sheets are attached at bottom and top to central upright members **64** of chords **30** and **32**. A single aluminum sheet may be used, as indicated by sheet **126** which spans a frame **120** through the sheet, or the sheet may be broken into segments, as indicated by the break between sheet **122** and sheet **126** occurring at frame **220**.

[0024] Referring to **Fig. 4** a representative elongated rail **60**, which may serve as either chord **30** or elongated base member **32**, is illustrated to advantage in perspective. Elongated rail **60** has a T-shaped cross section with a cross member or bar **62** and an upright member **64** which extends outwardly from one face of the cross bar **62**. At the juncture between upright member **64** and cross bar **62** a semi-cylindrical pocket **68** is formed which extends the length of rail **60** along one side of upright member **64**. Pocket **68** is formed by an indentation **66** in the base of upright member **64** and a raised lip **69** extending upwardly from cross bar **64**. Pocket **68** is accessible through a gap **71** (see **Fig. 7**) between lip **69** and upright member **64**. Four parallel grooves **70** are formed into face **72** of cross bar **62** opposite the face upright member **64** joins the cross bar. Grooves **70** extend parallel to pocket **68** for the length of rail **60**. As stated above, rail **60** is extruded from aluminum and can be given a curved shape to conform to the shape of a replacement roof. Pocket **68** provides a position for placement of a gusset edge or aluminum sheet edge.

[0025] **Figs. 5A-B** illustrate end gusset **38**, which is taken as representative of the gussets or

aluminum sheets generally. Gusset 25 has four edges one of which, intended for introduction to a pocket 68, is shaped as a hook 40 which is rounded on one side to nestle into pocket 68 under the main body of upright member 64 and indented on the opposite side to cooperate with lip 69. Hook edge 40 is intended to be fitted into the a pocket 68 in the usually straight, elongated base member 32.

[0026] Referring to **Figs. 6 and 7** views of an end portion of rafter 14 illustrate cooperation between a representative gusset, here end gusset 38. End gusset 38 connects chord 30 with elongated base member 32 by attachment to upright members 64, which extend toward one another from their respective rails. Attachment is by means of conventional fasteners 80 driven or screwed through the gusset 38 and adjacent upright member 64. Hook edge 40 of gusset 38 is positioned downwardly, disposed in pocket 68 of elongated base member 32. The opposite edge of gusset 38 may, at one end closer to the end of rafter 14, be placed in a pocket of chord 30, if provided. The bulk of the loading of gusset 38 is however carried through fasteners 80 whether gussets or an aluminum sheet is used.

[0027] In some embodiments the semi-cylindrical pocket 68 may be eliminated. Referring to **Fig. 8** a representative elongated rail 160, which may serve as either chord 30 or elongated base member 32, is illustrated. Elongated rail 160 has a T-shaped cross section with a cross member or bar 162 and an upright member 164 which extends outwardly from one face of the cross bar 162. At the juncture between upright member 164 and cross bar 162 a base platform 168 is formed which extends the length of elongated rail 160 along one side of upright member 164. Base 168 is formed by a raised section at the base, or point of juncture of upright member 164. Four parallel grooves 170 are formed into face 172 of cross bar 162 opposite the face upright member 164 joins the cross bar. Grooves 170 extend parallel platform 168 for the length of elongated rail 160. Rail 160 is extruded from aluminum and can given a curved shape to conform to the shape of a replacement roof. Platform 168 provides a position for placement of a gusset or aluminum sheet edge.

[0028] **Figs. 9A-B** illustrate end gusset 138, which is taken as representative of the gussets or aluminum sheets generally. Gusset 138 has four straight flat edges, anyone of which may abut a platform 169 for support.

[0029] Referring to **Fig. 10**, an end portion of rafter 14 illustrate cooperation between a representative gusset, here gusset 138 and a T-section aluminum rail 160 functioning as a chord. Edge 140 of gusset 138 is downwardly oriented, resting on platform 169 of elongated rail 160. The bulk of the loading of gusset 138 is imposed on fasteners 80 as illustrated in **Fig. 6**.

[0030] The invention provides a rafter of light weight, strong, and easily shaped to conform to curved roof lines. The rafter is also simple, facilitating its manufacture with reduced direct labor input.

[0031] While the invention is shown in only one of its forms, it is not thus limited but is susceptible to various changes and modifications without departing from the spirit and scope of the invention.